

FCC TEST REPORT

REPORT NO.: RF950613A12

MODEL NO.: VGP-WMS20

RECEIVED: June 13, 2006

TESTED: June 19 ~ 22, 2006

ISSUED: June 29, 2006

APPLICANT: PRIMAX ELECTRONICS LTD.

ADDRESS: No. 669, Ruey Kuang Road, Neihu, Taipei,
Taiwan, R.O.C.

ISSUED BY: Advance Data Technology Corporation

LAB LOCATION: No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Hsiang
244, Taipei Hsien, Taiwan, R.O.C.

This test report consists of 34 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by CNLA, A2LA or any government agencies. The test results in the report only apply to the tested sample.



Table of Contents

1.	CERTIFICATION	4
2.	SUMMARY OF TEST RESULTS	5
2.1	MEASUREMENT UNCERTAINTY	5
3.	GENERAL INFORMATION.....	6
3.1	GENERAL DESCRIPTION OF EUT	6
3.2	DESCRIPTION OF TEST MODES.....	7
3.2.1	CONFIGURATION OF SYSTEM UNDER TEST	7
3.2.2	TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:	8
3.3	GENERAL DESCRIPTION OF APPLIED STANDARDS	9
3.4	DESCRIPTION OF SUPPORT UNITS.....	9
4.	TEST TYPES AND RESULTS	10
4.1	CONDUCTED EMISSION MEASUREMENT	10
4.2	RADIATED EMISSION MEASUREMENT	10
4.2.1	LIMITS OF RADIATED EMISSION MEASUREMENT.....	10
4.2.2	TEST INSTRUMENTS	11
4.2.3	TEST PROCEDURES.....	12
4.2.4	DEVIATION FROM TEST STANDARD	12
4.2.5	TEST SETUP	13
4.2.6	EUT OPERATING CONDITIONS.....	13
4.2.7	TEST RESULTS.....	14
4.3	6dB BANDWIDTH MEASUREMENT	18
4.3.1	LIMITS OF 6dB BANDWIDTH MEASUREMENT	18
4.3.2	TEST INSTRUMENTS	18
4.3.3	TEST PROCEDURE	18
4.3.4	DEVIATION FROM TEST STANDARD	18
4.3.5	TEST SETUP	18
4.3.6	EUT OPERATING CONDITIONS.....	18
4.3.7	TEST RESULTS.....	19
4.4	MAXIMUM PEAK OUTPUT POWER	21
4.4.1	LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT	21
4.4.2	INSTRUMENTS	21
4.4.3	TEST PROCEDURES.....	21
4.4.4	DEVIATION FROM TEST STANDARD	21
4.4.5	TEST SETUP	22
4.4.6	EUT OPERATING CONDITIONS.....	22
4.4.7	TEST RESULTS.....	22
4.5	POWER SPECTRAL DENSITY MEASUREMENT.....	23
4.5.1	LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT	23
4.5.2	TEST INSTRUMENTS	23
4.5.3	TEST PROCEDURE	23
4.5.4	DEVIATION FROM TEST STANDARD	23
4.5.5	TEST SETUP	23
4.5.6	EUT OPERATING CONDITION	23



4.5.7	TEST RESULTS	24
4.6	BAND EDGES MEASUREMENT	26
4.6.1	LIMITS OF BAND EDGES MEASUREMENT	26
4.6.2	TEST INSTRUMENTS	26
4.6.3	TEST PROCEDURE	26
4.6.4	DEVIATION FROM TEST STANDARD	26
4.6.5	EUT OPERATING CONDITION	26
4.6.6	TEST RESULTS	27
4.7	ANTENNA REQUIREMENT	31
4.7.1	STANDARD APPLICABLE	31
4.7.2	ANTENNA CONNECTED CONSTRUCTION	31
5.	PHOTOGRAPHS OF THE TEST CONFIGURATION.....	32
6.	INFORMATION ON THE TESTING LABORATORIES	33
	APPENDIX-A	A-1



1. CERTIFICATION

PRODUCT: wireless laser mouse
BRAND NAME: SONY
MODEL NO.: VGP-WMS20
APPLICANT: PRIMAX ELECTRONICS LTD.
TESTED: June 19 ~ 22, 2006
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: FCC Part 15, Subpart C (Section 15.247),
ANSI C63.4-2003

The above equipment has been tested by **Advance Data Technology Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Annie Chang , **DATE:** June 29, 2006
(Annie Chang)

TECHNICAL ACCEPTANCE : Ken Liu , **DATE:** June 29, 2006
Responsible for RF (Ken Liu)

APPROVED BY : Gary Chang , **DATE:** June 29, 2006
(Gary Chang / Supervisor)

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C (Section 15.247)			
Standard Section	Test Type and Limit	Result	Remark
15.207	AC Power Conducted Emission	N/A	Power supply is 1.5Vdc from battery
15.247(a)(2)	Spectrum Bandwidth of a Direct Sequence Spread Spectrum System Limit: min. 500kHz	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power Limit: max. 30dBm	PASS	Meet the requirement of limit.
15.247(d)	Radiated Emissions Limit: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -4.01dB at 2483.50MHz
15.247(e)	Power Spectral Density Limit: max. 8dBm	PASS	Meet the requirement of limit.
15.247(d)	Band Edge Measurement Limit: 20dB less than the peak value of fundamental frequency	PASS	Meet the requirement of limit.

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Measurement	Uncertainty
Radiated emissions	3.55 dB

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	wireless laser mouse
MODEL NO.	VGP-WMS20
FCC ID	EMJM8B501
POWER SUPPLY	1.5Vdc from battery
MODULATION TYPE	GFSK
MODULATION TECHNOLOGY	DSSS
OUTPUT POWER	1.183mW
FREQUENCY RANGE	2402 ~ 2474MHz
NUMBER OF CHANNEL	13
ANTENNA TYPE	Monopole patch antenna with 2dBi
DATA CABLE	N/A
I/O PORTS	N/A
ASSOCIATED DEVICES	N/A

NOTE:

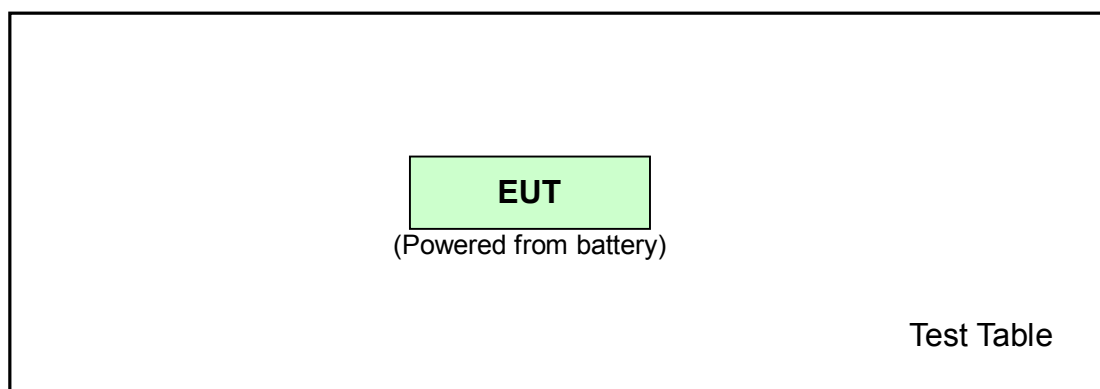
1. The EUT is a wireless laser mouse, which is a transmitter.
2. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

Thirteen channels are provided to this EUT:

CHANNEL	FREQ. (MHz)
1	2402
2	2408
3	2414
4	2420
5	2426
6	2432
7	2438
8	2444
9	2450
10	2456
11	2462
12	2468
13	2474

3.2.1 CONFIGURATION OF SYSTEM UNDER TEST



3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:

EUT configure mode	Applicable to				Description
	PLC	RE<1G	RE≥1G	APCM	
-	Note	√	√	√	NA

Where PLC: Power Line Conducted Emission RE<1G RE: Radiated Emission below 1GHz
 RE≥1G: Radiated Emission above 1GHz APCM: Antenna Port Conducted Measurement
 Note: No need to concern of Conducted Emission due to the EUT is powered by battery.

Radiated Emission Test (Below 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1 to 13	13	GFSK

Radiated Emission Test (Above 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1 to 13	1, 8, 13	GFSK

Bandedge Measurement:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1 to 13	1, 13	GFSK

Antenna Port Conducted Measurement:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1 to 13	1, 8, 13	GFSK



3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C. (15.247)

ANSI C63.4-2003

All test items have been performed and recorded as per the above standards.

3.4 DESCRIPTION OF SUPPORT UNITS

N/A

4. TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

N/A

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	May 21, 2007
HP Preamplifier	8449B	3008A01924	Sep. 06, 2006
HP Preamplifier	8449B	3008A01638	Sep. 21, 2006
ROHDE & SCHWARZ TEST RECEIVER	ESI7	836697/012	Nov. 01, 2006
Schwarzbeck Antenna	VULB 9168	137	Feb. 21, 2007
Schwarzbeck Antenna	VHBA 9123	480	Mar. 30, 2007
EMCO Horn Antenna	3115	6714	Oct. 26, 2006
EMCO Horn Antenna	3115	9312-4192	Mar. 14, 2007
ADT. Turn Table	TT100	0306	NA
ADT. Tower	AT100	0306	NA
Software	ADT_Radiated_V 7.6.011	NA	NA
TIMES RF cable	LL142	CABLE-CH6-01	Dec. 19, 2006
ROHDE & SCHWARZ Spectrum Analyzer	FSP 40	100036	Mar. 16, 2007

- NOTE:**
1. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.
 2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 3. The test was performed in ADT Chamber No. 6.
 4. The Industry Canada Reference No. IC 3789-6.

4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi- anechoic. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak method or average method as specified and then reported in data sheet.

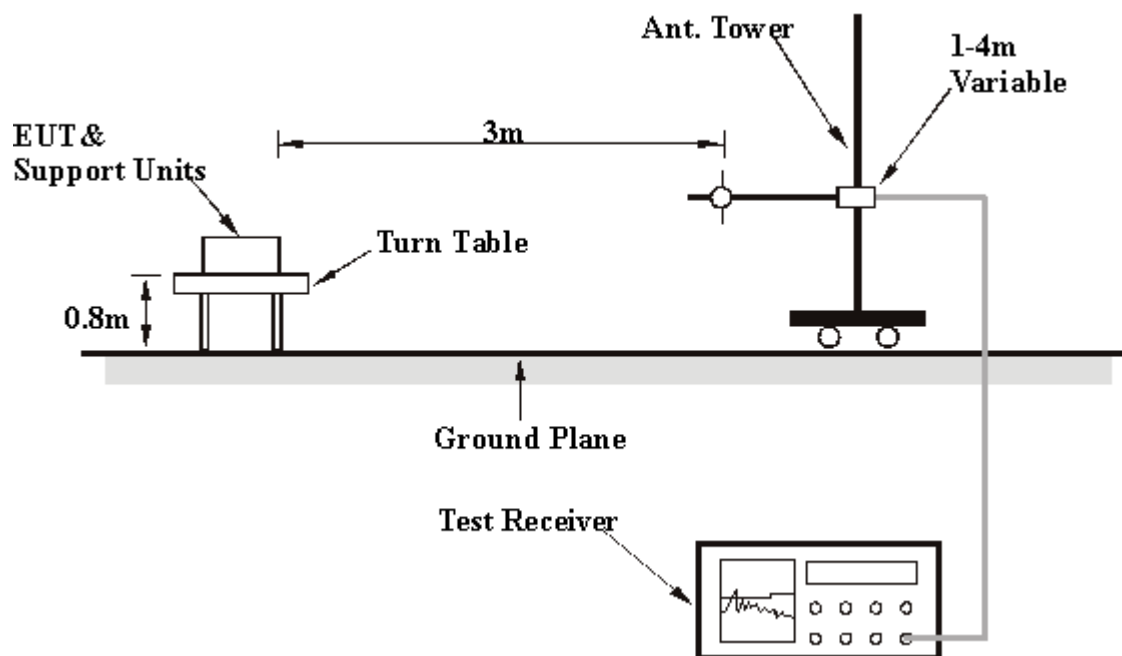
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.6 EUT OPERATING CONDITIONS

Set the EUT under transmission condition continuously at specific channel frequency.

4.2.7 TEST RESULTS

RADIATED WORST CASE DATA: BELOW 1GHz

MODULATION TYPE	GFSK	CHANNEL	13
INPUT POWER	1.5Vdc	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 76%RH, 1001hPa	DETECTOR FUNCTION	Quasi-Peak
TESTED BY	Jun Wu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	30.00	28.43 QP	40.00	-11.57	1.00 H	124	15.92	12.51
2	727.86	30.96 QP	46.00	-15.04	1.10 H	103	4.11	26.85
3	770.62	25.70 QP	46.00	-20.30	1.08 H	146	-2.20	27.90
4	807.56	25.11 QP	46.00	-20.89	1.22 H	214	-3.00	28.10
5	838.66	25.14 QP	46.00	-20.86	1.00 H	136	-3.23	28.36
6	873.65	25.94 QP	46.00	-20.06	1.00 H	295	-3.03	28.97

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	745.35	24.01 QP	46.00	-21.99	1.24 V	302	-3.59	27.60
2	786.17	25.40 QP	46.00	-20.60	1.17 V	109	-2.57	27.97
3	826.99	24.38 QP	46.00	-21.62	1.02 V	229	-3.89	28.27
4	873.65	25.25 QP	46.00	-20.75	1.48 V	207	-3.72	28.97
5	924.19	27.03 QP	46.00	-18.97	1.00 V	217	-3.06	30.09
6	955.29	26.84 QP	46.00	-19.16	1.03 V	187	-3.80	30.64

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 - 3The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.



RADIATED WORST CASE DATA: ABOVE 1GHz

MODULATION TYPE	GFSK	CHANNEL	1
INPUT POWER	1.5Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	26deg. C, 76%RH, 1001hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	60.64 PK	74.00	-13.36	1.30 H	240	24.42	36.22
1	2390.00	47.84 AV	54.00	-6.16	1.30 H	240	11.62	36.22
2	*2402.00	98.75 PK			1.30 H	240	62.51	36.23
2	*2402.00	71.06 AV			1.30 H	240	34.83	36.23
3	4804.00	62.34 PK	74.00	-11.66	1.42 H	240	17.83	44.51
3	4804.00	34.65 AV	54.00	-19.35	1.42 H	240	-9.86	44.51
4	7206.00	60.73 PK	74.00	-13.27	1.24 H	313	10.70	50.03
4	7206.00	33.04 AV	54.00	-20.96	1.24 H	313	-16.99	50.03

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	60.81 PK	74.00	-13.19	1.38 V	114	24.59	36.22
1	2390.00	47.92 AV	54.00	-6.08	1.38 V	114	11.70	36.22
2	*2402.00	88.68 PK			1.38 V	114	52.44	36.23
2	*2402.00	60.99 AV			1.38 V	114	24.76	36.23
3	4804.00	63.53 PK	74.00	-10.47	1.00 V	339	19.02	44.51
3	4804.00	35.84 AV	54.00	-18.16	1.00 V	339	-8.67	44.51
4	7206.00	63.15 PK	74.00	-10.85	1.02 V	307	13.12	50.03
4	7206.00	35.46 AV	54.00	-18.54	1.02 V	307	-14.57	50.03

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “ : Fundamental frequency

MODULATION TYPE	GFSK	CHANNEL	8
INPUT POWER	1.5Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	26deg. C, 76%RH, 1001hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2444.00	98.34 PK			1.28 H	238	62.01	36.33
1	*2444.00	70.65 AV			1.28 H	238	34.32	36.33
2	4888.00	63.35 PK	74.00	-10.65	1.40 H	241	18.97	44.37
2	4888.00	35.66 AV	54.00	-18.34	1.40 H	241	-8.72	44.37
3	7332.00	59.24 PK	74.00	-14.76	1.00 H	323	8.69	50.55
3	7332.00	31.55 AV	54.00	-22.45	1.00 H	323	-19.00	50.55

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2444.00	89.15 PK			1.06 V	302	52.82	36.33
1	*2444.00	61.46 AV			1.06 V	302	25.13	36.33
2	4888.00	62.91 PK	74.00	-11.09	1.21 V	334	18.53	44.37
2	4888.00	35.22 AV	54.00	-18.78	1.21 V	334	-9.16	44.37
3	7332.00	61.73 PK	74.00	-12.27	1.00 V	318	11.18	50.55
3	7332.00	34.04 AV	54.00	-19.96	1.00 V	318	-16.51	50.55

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “ : Fundamental frequency

MODULATION TYPE	GFSK	CHANNEL	13
INPUT POWER	1.5Vdc	FREQUENCY RANGE	1 ~ 25GHz
ENVIRONMENTAL CONDITIONS	26deg. C, 76%RH, 1001hPa	DETECTOR FUNCTION	Peak(PK) Average (AV)
TESTED BY	Jun Wu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2474.00	96.11 PK			1.30 H	246	59.66	36.45
1	*2474.00	68.42 AV			1.30 H	246	31.97	36.45
2	2483.50	61.38 PK	74.00	-12.62	1.30 H	246	24.90	36.48
2	2483.50	49.99 AV	54.00	-4.01	1.30 H	246	13.51	36.48
3	4948.00	65.62 PK	74.00	-8.38	1.07 H	228	21.15	44.48
3	4948.00	37.93 AV	54.00	-16.07	1.07 H	228	-6.54	44.48
4	7422.00	59.54 PK	74.00	-14.46	1.08 H	168	8.49	51.05
4	7422.00	31.85 AV	54.00	-22.15	1.08 H	168	-19.20	51.05

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2474.00	87.26 PK			1.05 V	335	50.81	36.45
1	*2474.00	59.57 AV			1.05 V	335	23.12	36.45
2	2483.50	60.44 PK	74.00	-13.56	1.05 V	335	23.96	36.48
2	2483.50	48.93 AV	54.00	-5.07	1.05 V	335	12.45	36.48
3	4948.00	65.62 PK	74.00	-8.38	1.09 V	183	21.15	44.48
3	4948.00	37.93 AV	54.00	-16.07	1.09 V	183	-6.54	44.48
4	7422.00	61.47 PK	74.00	-12.53	1.23 V	316	10.42	51.05
4	7422.00	33.78 AV	54.00	-20.22	1.23 V	316	-17.27	51.05

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * ” : Fundamental frequency

4.3 6dB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100036	Mar. 16. 2007

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

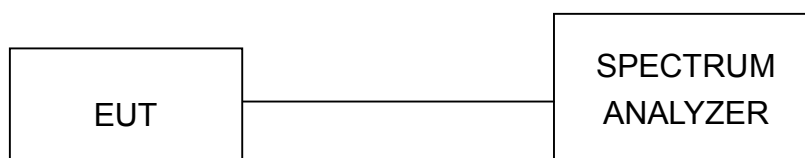
4.3.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 100kHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

4.3.5 TEST SETUP



4.3.6 EUT OPERATING CONDITIONS

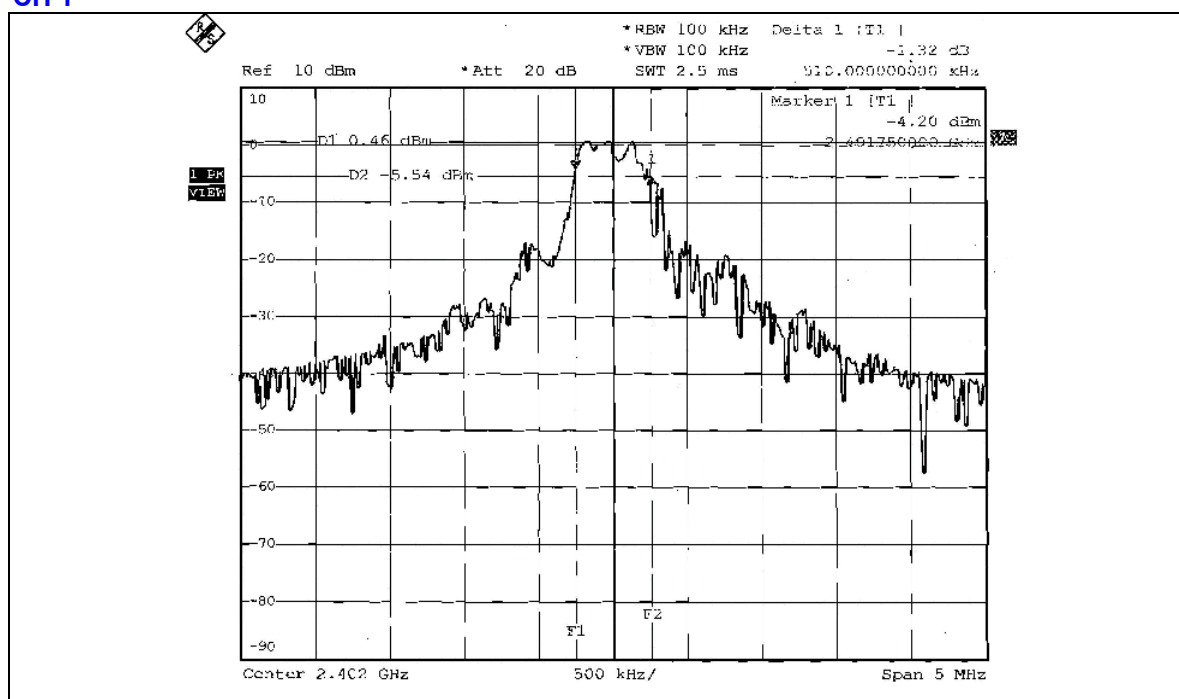
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.3.7 TEST RESULTS

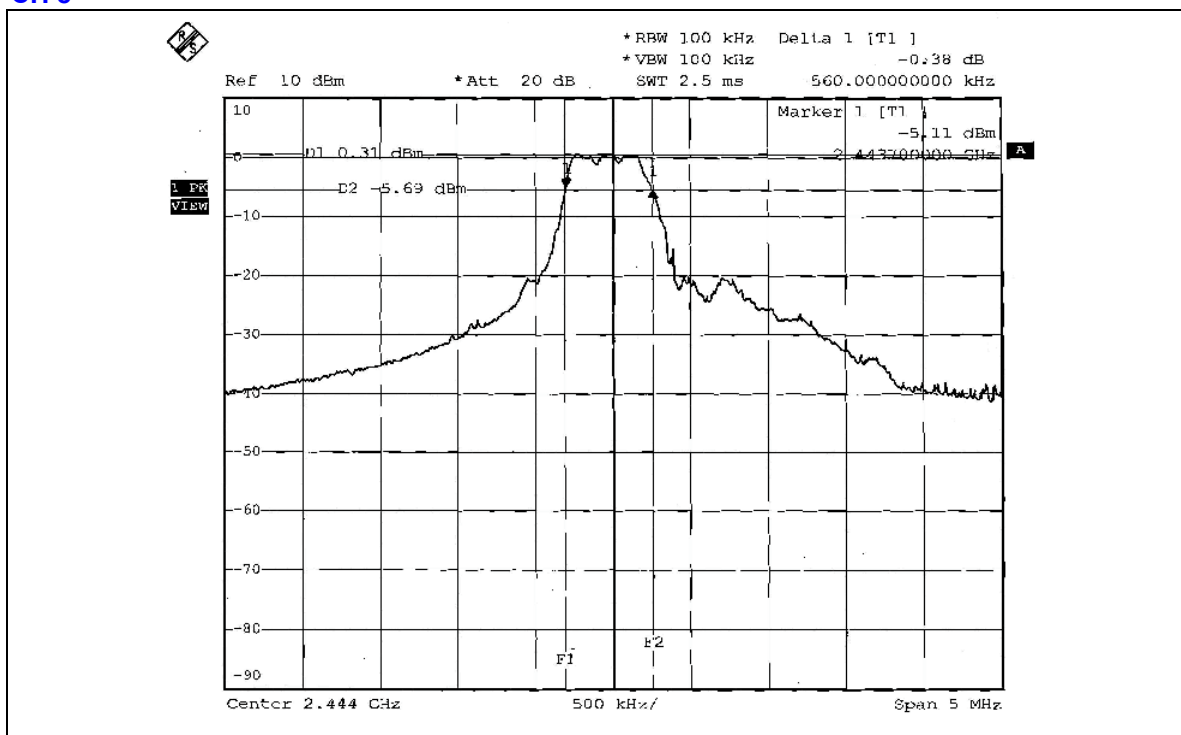
MODULATION TYPE	GFSK	CHANNEL	1, 8, 13
INPUT POWER	1.5Vdc	ENVIRONMENTAL CONDITIONS	26deg. C, 76%RH, 1001hPa
TESTED BY	Jun Wu		

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS/FAIL
1	2402	0.51	0.5	PASS
8	2444	0.56	0.5	PASS
13	2474	0.52	0.5	PASS

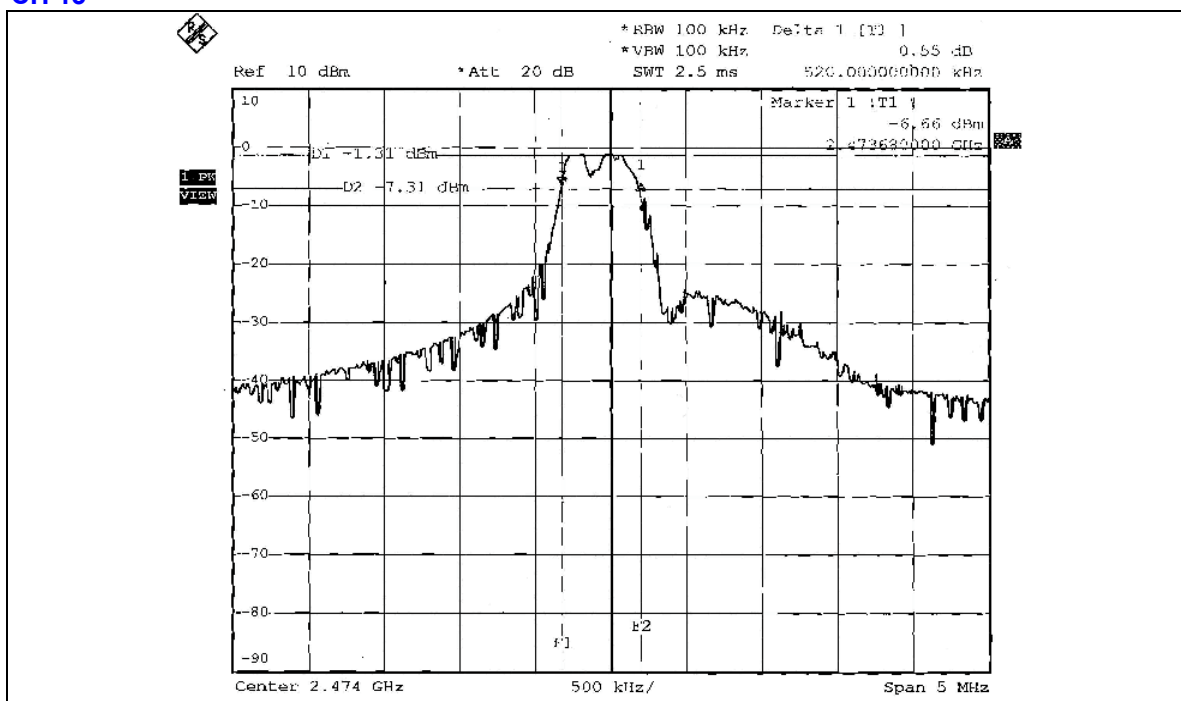
CH 1



CH 8



CH 13





4.4 MAXIMUM PEAK OUTPUT POWER

4.4.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 30dBm.

4.4.2 INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100036	Mar. 16. 2007

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.4.3 TEST PROCEDURES

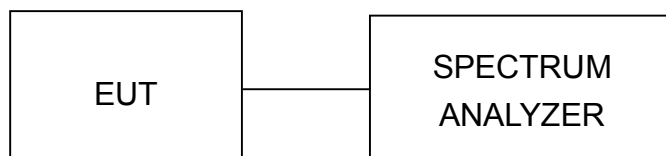
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 1 MHz RBW and 1 MHz VBW, the peak value was measured and recorded.
4. Repeat above procedures until all frequencies measured were complete.

Note: The spectrum plots are attached on following pages.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



4.4.6 EUT OPERATING CONDITIONS

Same as Item 4.3.6

4.4.7 TEST RESULTS

MODULATION TYPE	GFSK	CHANNEL	1, 8, 13
INPUT POWER	1.5Vdc	ENVIRONMENTAL CONDITIONS	26deg. C, 76%RH, 1001hPa
TESTED BY	Jun Wu		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER OUTPUT (mW)	PEAK POWER LIMIT (dBm)	PASS/FAIL
1	2402	0.73	1.183	30	PASS
8	2444	-0.63	0.865	30	PASS
13	2474	0.11	1.026	30	PASS

4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

4.5.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100036	Mar. 16. 2007

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.5.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3kHz RBW and 30kHz VBW, set sweep time = span/3kHz.

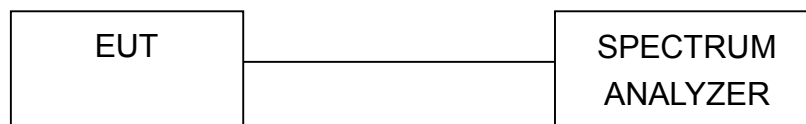
The power spectral density was measured and recorded.

The sweep time is allowed to be longer than span/3kHz for a full response of the mixer in the spectrum analyzer.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



4.5.6 EUT OPERATING CONDITION

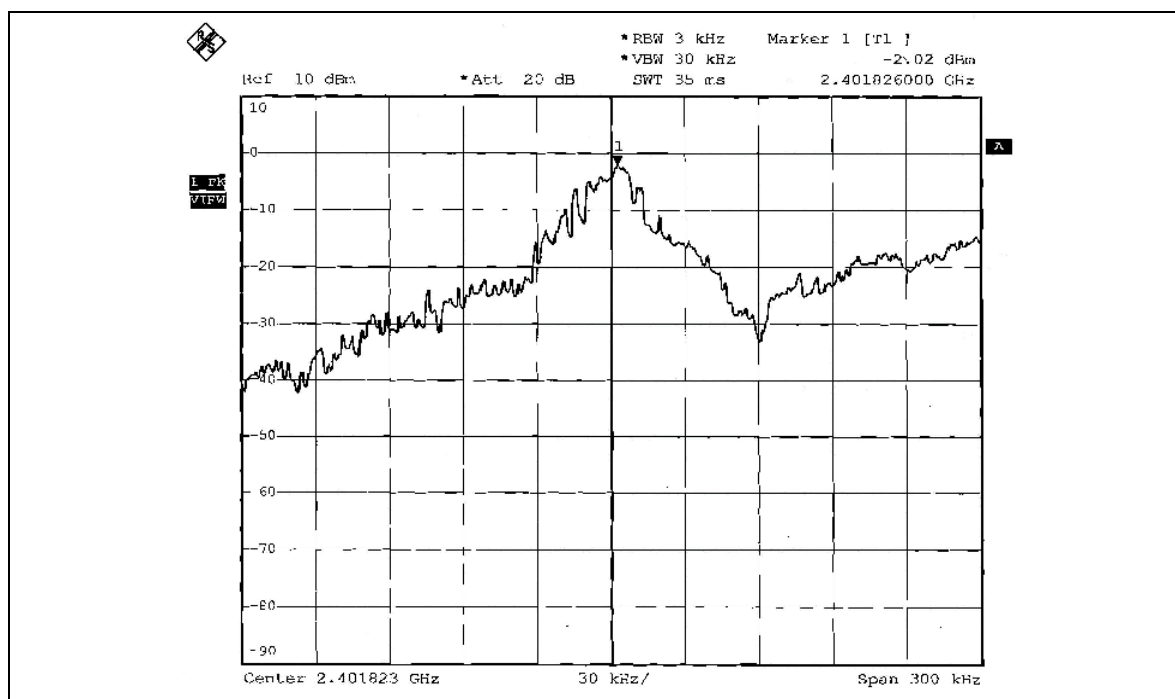
Same as Item 4.3.6

4.5.7 TEST RESULTS

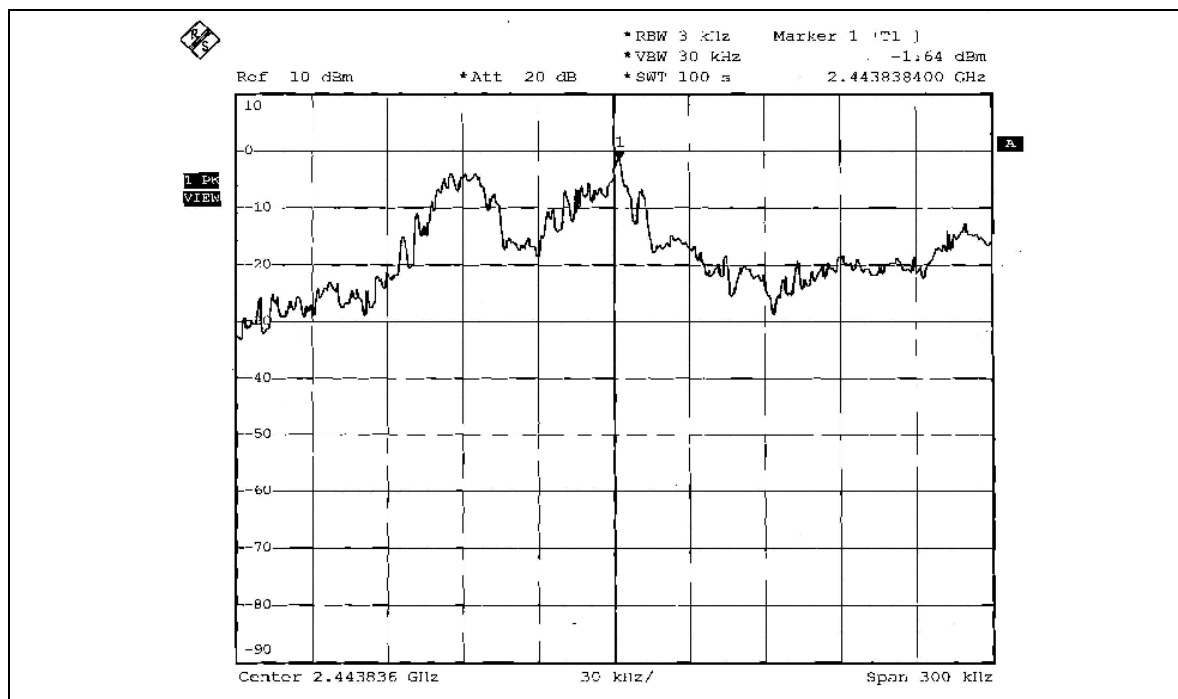
MODULATION TYPE	GFSK	CHANNEL	1, 8, 13
INPUT POWER	1.5Vdc	ENVIRONMENTAL CONDITIONS	26deg. C, 76%RH, 1001hPa
TESTED BY	Jun Wu		

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
1	2402	-2.02	8	PASS
8	2444	-1.64	8	PASS
13	2474	-2.32	8	PASS

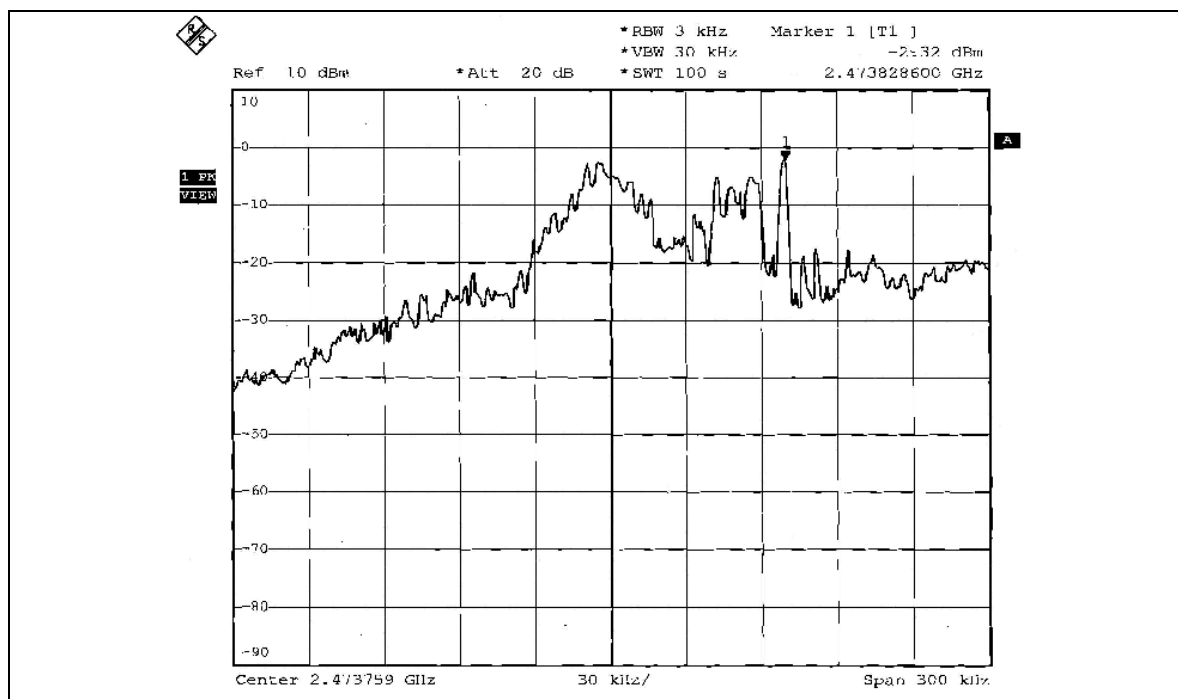
CH 1



CH 8



CH 13





4.6 BAND EDGES MEASUREMENT

4.6.1 LIMITS OF BAND EDGES MEASUREMENT

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.6.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100036	Mar. 16. 2007

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.6.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low loss cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 100 kHz suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

The spectrum plots (Peak RBW=VBW=100kHz) are attached on the following pages.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 EUT OPERATING CONDITION

Same as Item 4.3.6

4.6.6 TEST RESULTS

The spectrum plots are attached on the following 2 images. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement in part 15.247(d).

Note 1:

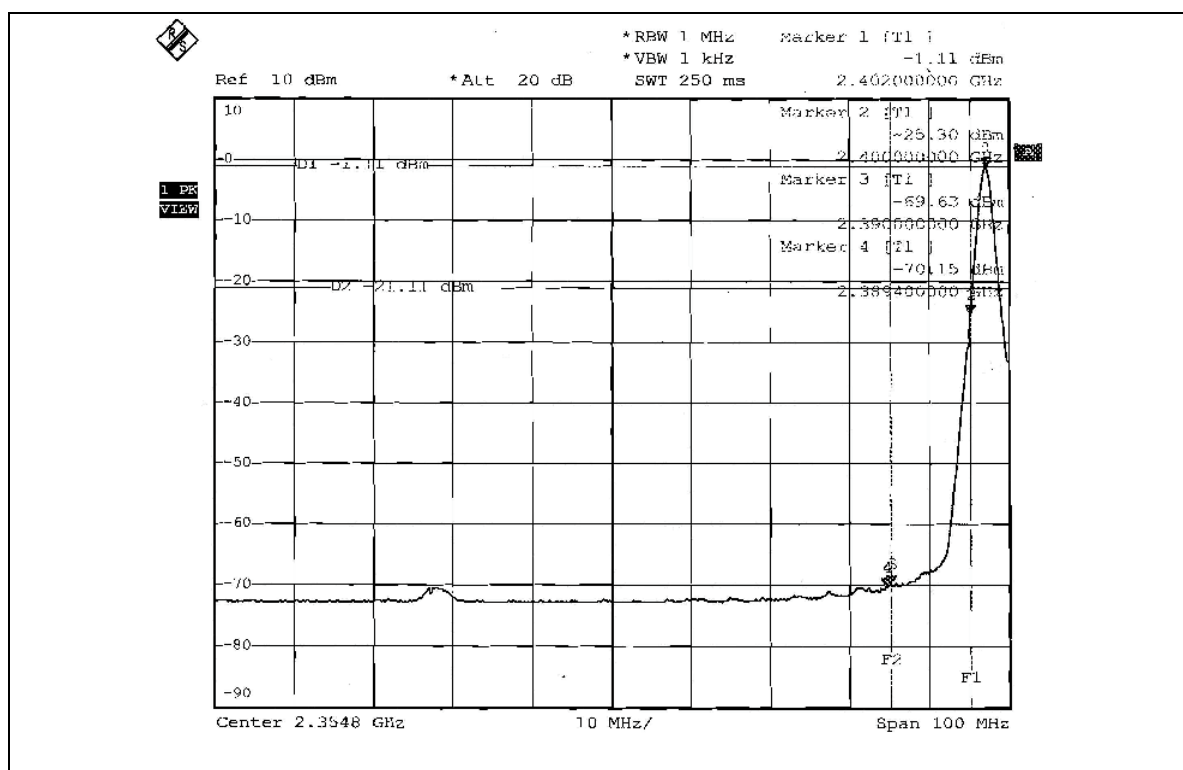
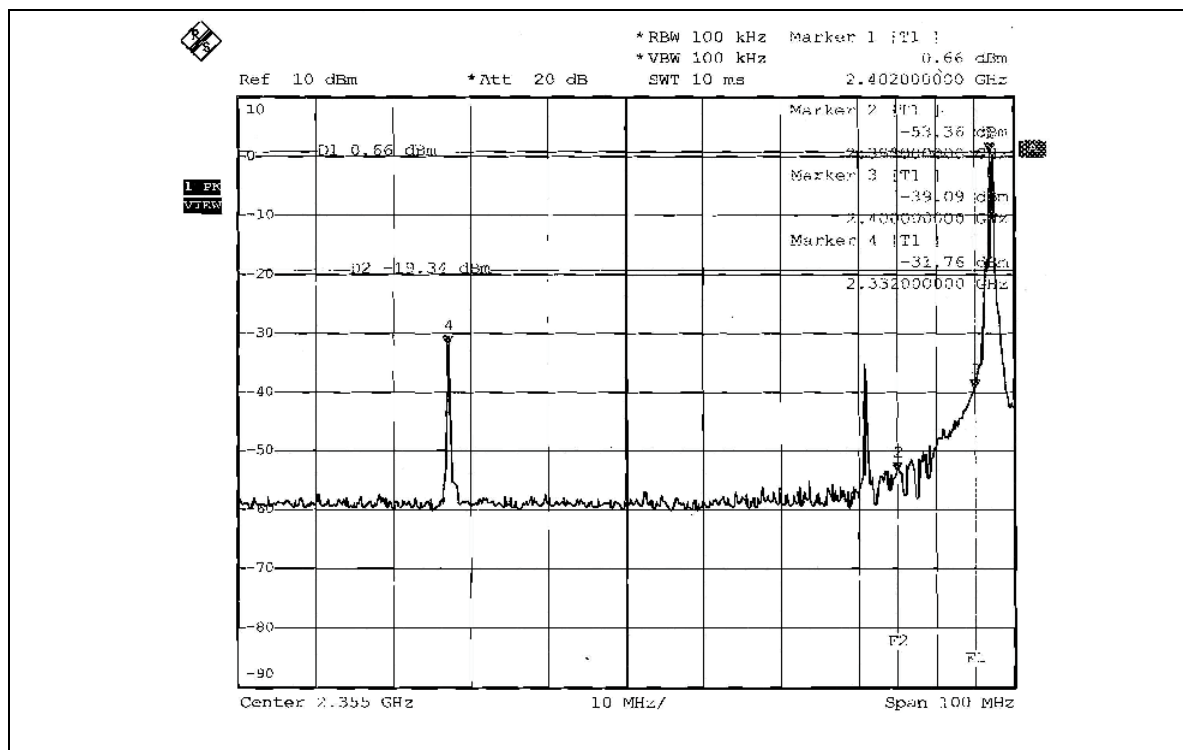
The band edge emission plot on page 28 shows 32.42dBc between carrier maximum power and local maximum emission in restrict band (2.3320GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 98.75dBuV/m (Peak), so the maximum field strength in restrict band is $98.75 - 32.42 = 66.33$ dBuV/m which is under 74dBuV/m limit.

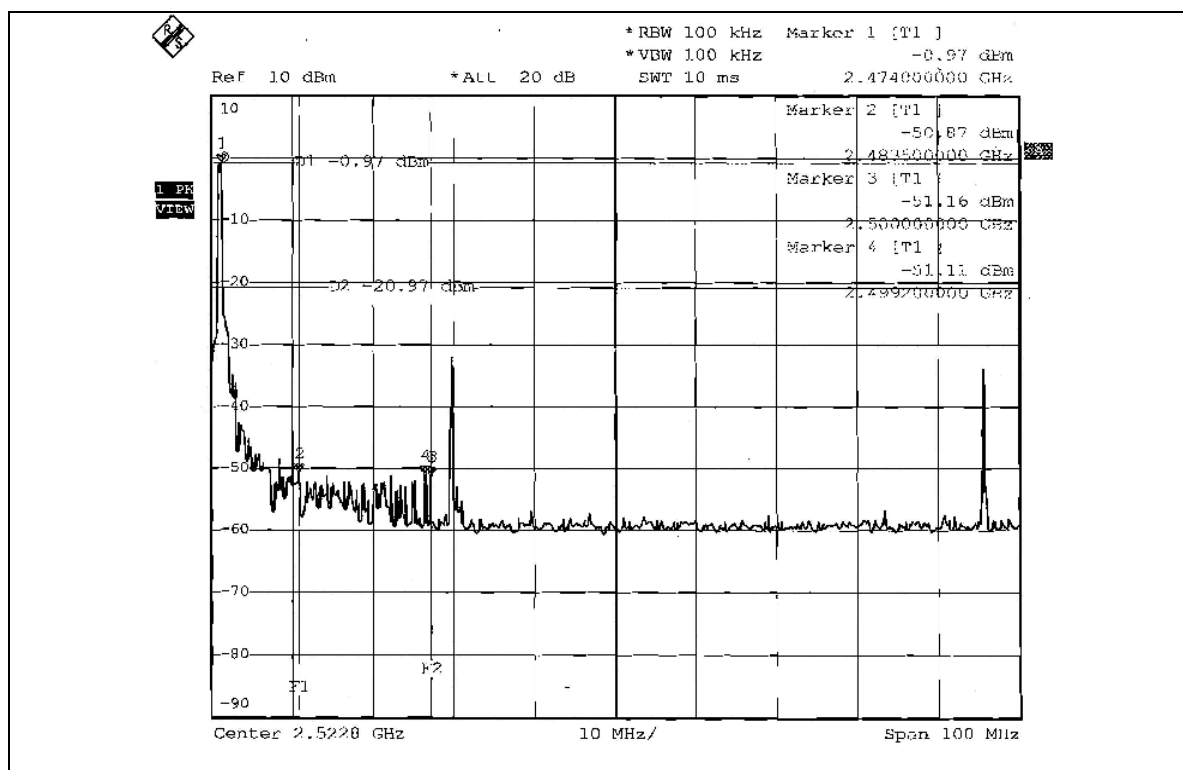
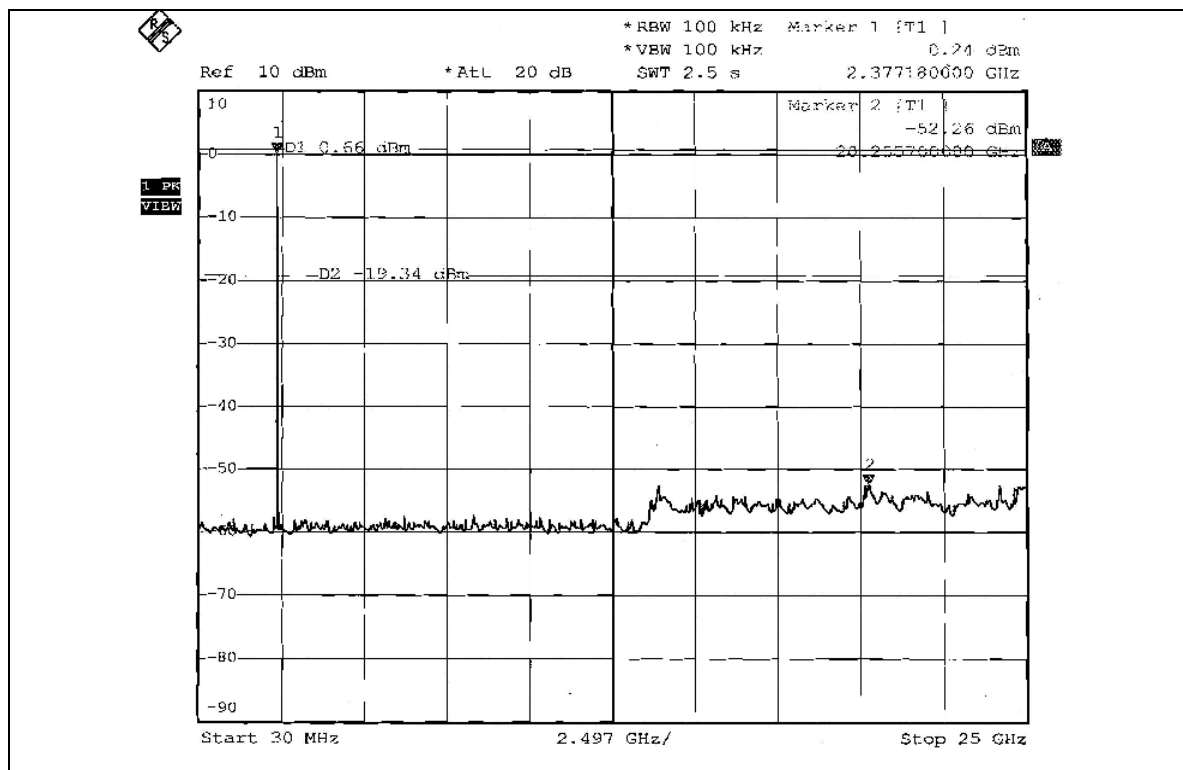
The band edge emission plot of on page 28 shows 68.52dBc between carrier maximum power and local maximum emission in restrict band (2.3900GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 71.06dBuV/m (Average), so the maximum field strength in restrict band is $71.06 - 68.52 = 2.54$ dBuV/m which is under 54dBuV/m limit.

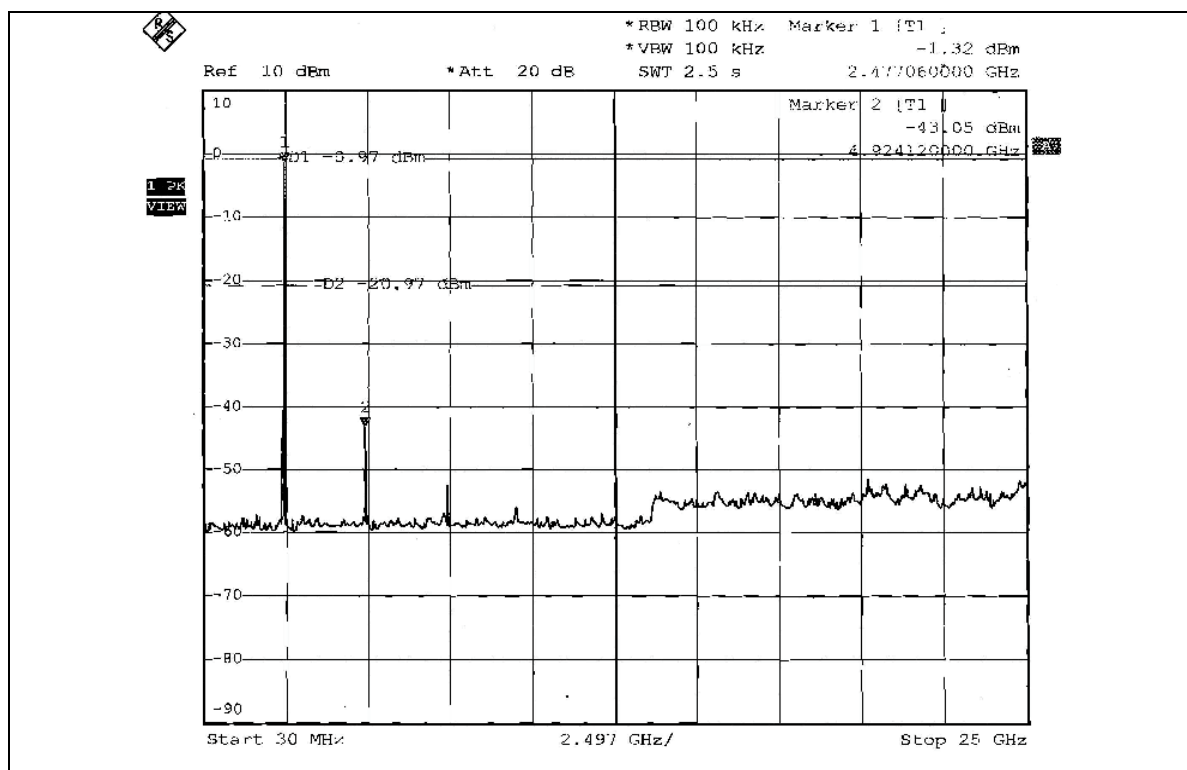
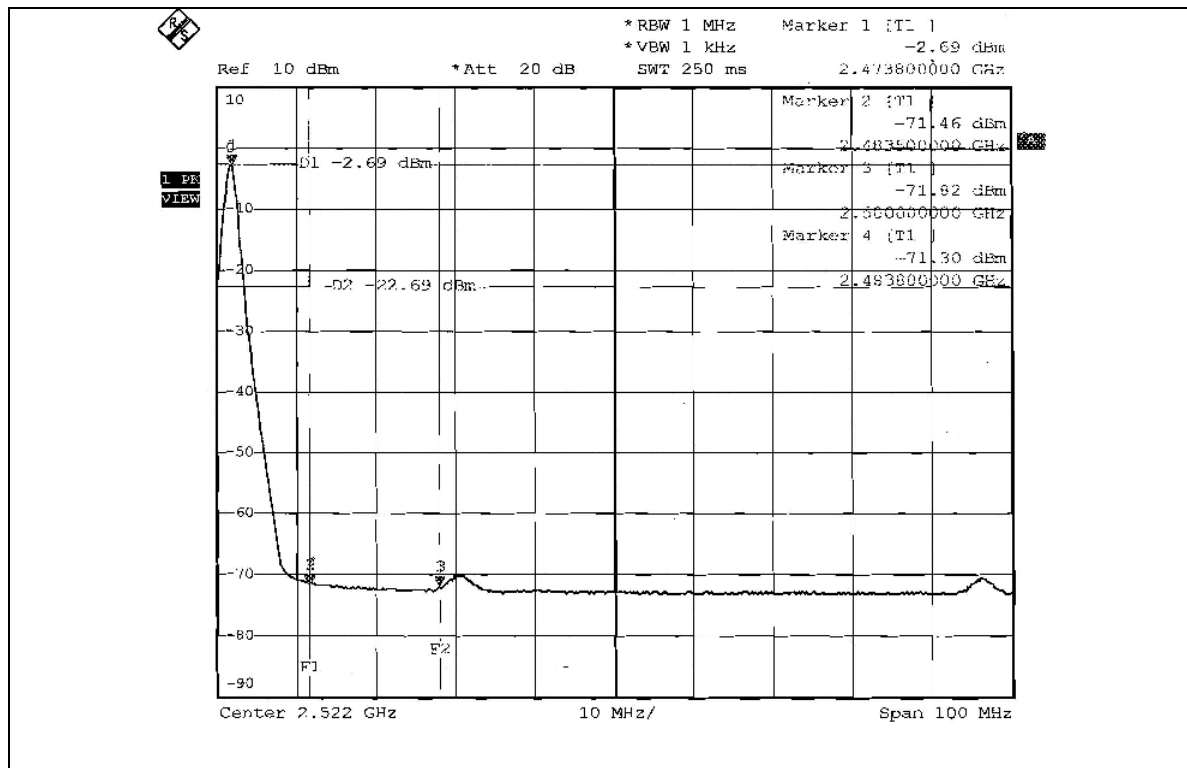
Note 2:

The band edge emission plot on page 25 shows 49.90dBc between carrier maximum power and local maximum emission in restrict band (2.4835GHz). The emission of carrier strength list in the test result of channel 13 at the item 4.2.7 is 96.11dBuV/m (Peak), so the maximum field strength in restrict band is $96.11 - 49.90 = 46.21$ dBuV/m which is under 74dBuV/m limit.

The band edge emission plot of on page 30 shows 68.61dBc between carrier maximum power and local maximum emission in restrict band (2.4859GHz). The emission of carrier strength list in the test result of channel 13 at the item 4.2.7 is 68.42dBuV/m (Average), so the maximum field strength in restrict band is $68.42 - 68.61 = -0.19$ dBuV/m which is under 54dBuV/m limit.







4.7 ANTENNA REQUIREMENT

4.7.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.7.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used in this product is Monopole patch antenna without connector. The maximum Gain of the antenna is 2dBi.

5. PHOTOGRAPHS OF THE TEST CONFIGURATION

RADIATED EMISSION TEST





6. INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC, UL, A2LA
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA , CSA
R.O.C.	CNLA, BSMI, NCC
Netherlands	Telefication
Singapore	PSB , GOST-ASIA(MOU)
Russia	CERTIS(MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site:

www.adt.com.tw/index.5/phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety Telecom Lab:

Tel: 886-3-3183232

Fax: 886-3-3185050

Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also



APPENDIX-A

MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.